APPENDIX F

CONSTRUCTION BEST MANAGEMENT PRACTICES PLAN (BMP)

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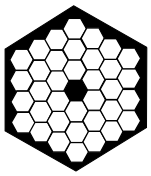
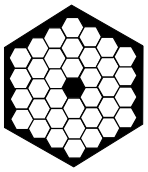


W. M. KECK OBSERVATORY
CALIFORNIA ASSOCIATION FOR RESEARCH IN ASTRONOMY



Keck Interferometer Outrigger Telescopes

CONSTRUCTION BEST MANAGEMENT PRACTICES PLAN (BMP)

Draft Revision A

January 23, 2002

Keck Interferometer Plan

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Version:	A – Draft pending site works contract
Date:	1/23/2002
Approvals:	Jim Beletic
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Upon obtaining project approval for the new Keck Outrigger Telescopes, this Best Management Practices Plan (BMP) will be used to guide all activities associated with construction of the outrigger telescopes. The plan will serve as a working document that may be expanded and revised prior to project start. It will become part of the agreements/contracts with site work contractors. The purpose of this document is to facilitate project management by developing an organizational structure that will guide construction management, designate who has the authority to make decisions, and provide a checklist to ensure compliance with all mitigating measures and conditions on the project. It is a primary management tool for the CARA Construction Manager and Contractor's Project Manager. This Best Management Practices Plan becomes null and void if for some reason the project fails to move forward.

I. OVERVIEW

A. PURPOSE

The purpose of the Construction Best Management Practices Plan (BMP) is to specify the methods and controls which will be implemented to prevent or minimize negative impacts to the surrounding environment, and to the natural and cultural resources on and adjacent to the W. M. Keck Observatory (WMKO) site during the construction of the Outrigger Telescopes project. Included in these controls is a proposed organizational structure which clearly sets forth the lines of authority and responsibility that will ensure proper supervision and oversight throughout the construction process.

The BMP will be overseen by the CARA Construction Manager and implemented by the Contractor's Project Manager. A Construction Management Organization Chart, identifying the proposed hierarchy and working relationships among the various interested parties, is attached (Figure 1). The BMP and accompanying organization chart will be finalized by CARA in coordination with the selected Contractor. It will also be attached to the construction contracts. The CARA Construction Manager will have the primary responsibility for all construction activities.

B. SCOPE OF THE CONSTRUCTION BMP

All construction activities related to the Outrigger Telescopes Project—from delivery of materials and equipment (to either the WMKO site or one of the two construction staging areas, Figure 2), through final clean up of the staging areas, stockpile area (Figure 3) and WMKO site—will be controlled by the BMP. These activities include, but are not limited to:

- Unloading containers at the staging area and delivering the contents to the site.
- Installing sheet piling, as required by the Hawaii Electric Light Company (HELCO), to protect power cables from inadvertent disturbance by construction equipment. Removal of piles upon completion of construction will also adhere to this plan.
- Excavating and trenching for junction boxes, light pipes and air pipes, enclosure and telescope footings, underground coudé rooms and tunnels.
- Removing excess excavated material, not used for backfill, to the approved summit stockpile area (Figure 3) to be screened, washed and used for Wēkiu habitat restoration on and adjacent to WMKO site.
- Grading and shoring for Outrigger Telescope enclosures and junction boxes, including placement of fill and construction of retaining walls.
- Pouring concrete (ready-mixed in Hilo or Waimea) for a tunnel, ring wall, retaining walls and telescope foundations.
- Installing up to five prefabricated junction boxes and up to six prefabricated coudé rooms (or pouring concrete if prefabricated structures are unavailable).
- Installing light pipes (together with electrical conduits) and air pipes.
- Assembling prefabricated enclosures, consisting of ring walls and rotating domes, on site; setting the ring walls on concrete footings and installing the domes on their tops.
- Installing a telescope, dual star module and other hardware within each enclosure.
- Complying with the Wēkiu Bug Mitigation Plan, including the restoration of Wekiu bug habitat.

- Maintaining the summit construction staging and stockpile areas (Figure 3), on-site stockpile areas and the construction staging area at Hale Pohaku (Figure 2) in clean, safe condition.
- Care and maintenance of equipment and vehicles.
- Cleanup of all construction areas.
- Complying with the Memorandum of Agreement on cultural resources.

II. ENVIRONMENTAL AND CULTURAL CONCERNS

A. WĒKIU BUG

Although the actual construction site has been altered by past development activities, nearby Wēkiu bug habitat could be affected by construction of the proposed project (Figure 4). The major negative effects that could occur during Outrigger Telescope construction are: trash, dust, side-cast cinder, introduction of non-native species, and spills of hazardous materials. The control and mitigation of these concerns will follow the Wēkiu Bug Mitigation Plan. Foot traffic in Wēkiu Bug habitat can be harmful to the habitat. The Construction Manager will ensure that the only foot traffic in the habitat will be with the concurrence of the project entomologist.

B. CULTURAL CONCERNS

Historic District. The State Historic Preservation Division (SHPD) believes that the summit region of Mauna Kea is eligible for listing in the National Register of Historic Places as an Historic District. The cluster of cones forming the summit, including Puʻu Hauʻoki, would be a contributing historic property to this district and itself meets the criteria for listing in the National Register of Historic Places. Measures that would prevent or minimize activities that would further impact the structural and visual integrity (i.e., shape and contour) of the Puʻu Hauʻoki cinder cone and its crater are a primary focus of the BMP.

Potential Burial Sites. Most of the land to be used for the Outrigger Telescopes has been previously altered to such an extent that there is a low probability of discovering burials on the site. An exception to this applies to areas near the outer edges of the Puʻu Hauʻoki plateau, where it had not been previously disturbed other than being subjected to side-casting of cinder from the original grading of the plateau. Because the existence of burials cannot be conclusively verified, the project archeologist will monitor all excavation.

View Planes. All above ground parts of junction boxes and retaining walls will be colored to match the cinder.

III. PRE-CONSTRUCTION ACTIONS

A. COORDINATION

Prior to construction mobilization, meetings will be held to finalize all aspects of the construction process. The following information will be exchanged between CARA (including the Archeological, Cultural and Wēkiu Bug Monitors) and the Contractor at least two weeks before these meetings take place.

1.0 Information to be provided by CARA

a) A location map identifying all construction, staging and stockpile areas.

b) A description of the type, composition and quantity of material expected to be excavated during the project and its disposition.

c) A description of the type, composition and quantity of fill material to be used, including locations of temporary on-site stockpiles.

d) A chart showing preferred construction sequence (a schedule of construction activities) that will: (a) minimize potential adverse cultural and environmental effects, and (b) allow efficient scheduling of appropriate monitoring times.

e) A Construction Management Organization Chart, such as shown in Figure 1, that will clearly delineate lines of authority and responsibility; phone numbers of key personnel will also be included.

f) Provide a detailed description of specific mitigating measures to protect and preserve the natural and historic/cultural attributes of the project area.

g) Based on the Organization Chart, designation of areas of responsibility, names and phone numbers of responsible individuals, names and phone numbers of special advisors, and steps that will be taken to accomplish the following:
   - control of all trash and construction material stored on site;
   - removal of all trash on a regular basis;
   - monitoring of construction activity to ensure that no cinder or other materials are side-cast into the Puʻu Hauʻoki crater or the outer slopes of the cone;
   - ensuring compliance with all provisions of the Section 106 memorandum of agreement (MOA) to be entered into by NASA, the Advisory Council on Historic Preservation, State Historic Preservation Officer, and others;
   - monitoring the on-site use of paints, thinners, and solvents and other hazardous materials and reporting spills to designated individuals;
   - ensuring that earth-moving equipment is free of large deposits of soil, dirt and vegetation debris that may harbor non-native species; and
   - ensuring that new non native species introductions detected during monitoring as described in Wēkiu Bug Monitoring Plan are eradicated;
   - ensuring compliance with all provisions of the Wēkiu Bug Mitigation Plan.

h) A list of telephone numbers of the responsible persons and alternates to be contacted (day or night) when violations are suspected. (After inspecting a particular incident, these individuals report their findings to the CARA Construction Manager; they do not interact with the workers or try to fix it themselves except for the archaeologist has the immediate authority to stop construction work in the area of an identified or potential find. The resource or burial could easily be destroyed by the time the Construction Manager is found, the issue discussed, and directive given. The archaeologist may also be responsible for discussing any findings with the SHPO and the cultural monitor under the Section 106 MOA.

i) A set of criteria to be used when determining whether or not to stop construction.

j) An emergency response plan for unplanned events to be based on the CARA Safety Manual.

2.0 Information to be provided by the Contractor

a) A list identifying the characteristics of raw materials to be brought to the site or lay down area, including:
   - the type of materials to be used, by construction phase;

- the frequency of delivery of these materials to the site;
- the quantities to be stored and length of storage;
- the location of proposed on-site storage and stockpile areas; and
- a description of how the Contractor would clean and care for these areas and materials.

b) A written summary of the characteristics and source of any discharge and potential pollutants associated with each construction activity together with proposed control measures or treatment methods, including but not limited to the following discharges:
   - solid waste,
   - oily waste,
   - hazardous waste, and
   - equipment cleaning and washing of cement truck mixers.

c) A written summary describing the type and characteristics of vehicles and equipment to be used, including:
   - the duration of use by construction phase by vehicle and equipment type;
   - emission characteristics by vehicle and equipment type;
   - noise characteristics by vehicle and equipment type;
   - type of fuel used by vehicle and equipment type; and
   - on-site use and/or storage area(s) for each type of equipment.

d) An implementation plan for suspending all dust-generating activities and securing equipment and materials during high winds and storms.

e) A plan to control wind and water erosion during the construction period.

f) An implementation plan for cleaning vehicles and equipment to rid them of non-native species of plants and animals prior to transportation to the construction site.

B. ARCHAEOLOGICAL CONSULTATION

CARA and the Contractor will meet at least 2 weeks before construction starts with a qualified archaeologist as defined in the MOA (known as the project archeologist) to determine the scope and schedule of archaeological monitoring activities during the construction period. The archaeologist will first identify potentially sensitive construction areas on the WMKO site. The archaeologist, in coordination with the CARA Construction Manager and the Contractor, will develop standards and criteria for monitoring excavation activities and determining when remedial actions are required and work must be stopped. The archaeologist will then be present on site to monitor all excavation. The archaeologist will follow SHPD standards for archaeological monitoring studies and reports (HAR Chapter 279). The archaeologist has the immediate authority to stop construction work in the area of an identified or potential find. The archaeologist may also be responsible for discussing any findings with the SHPO and the cultural monitor under the Section 106 MOA. The archeologist is encouraged to work with the cultural monitor in developing monitoring plans and actual monitoring. The archeologist has the discretion to make random visits to the project site, but for safety reasons must check in with the Construction Manger before entering the site.

C. CULTURAL MONITORING

The CARA Construction Manager and the Contractor will meet with the project cultural monitor to determine the scope and schedule of cultural monitoring activities during the construction period at least 2 weeks before construction starts. The cultural monitor, in coordination with the CARA Construction Manager and the Contractor, will develop standards and criteria for monitoring construction activity and determining when remedial actions are required. Details of the monitoring and required qualifications of the monitor are defined in the cultural resources MOA. The project cultural monitor is encouraged to work with the project archeological monitor in developing monitoring plans and actual monitoring. The project cultural monitor has the discretion to make random visits to the project site, but for safety reasons must check in with the Construction Manger before entering the site.

D. FINALIZE PLANS AND PROCEDURES

The CARA Construction Manager and the Contractor Project Manager will meet, discuss and revise all information and produce a final Organization Chart, a set of criteria for ensuring compliance with all mitigating measures, and criteria and procedures for stopping construction if necessary.

E. PREPARE MONITORING AND REPORTING SCHEDULES

The CARA Construction Manager, in consultation with various specialists and the Contractor, will prepare schedules for monitoring on-going activities for compliance with the BMP. Procedures for reporting violations and the status of corrective measures to bring the project into compliance will also be determined. The name and phone number of each monitor will be identified.

F. FIELD MANUAL OF PROCEDURES AND PRACTICES

The CARA Construction Manager, in cooperation with CARA, the Contractor, OMKM and special advisors, will prepare a manual which will incorporate the finalized BMP; specific emergency response plans for injuries, medical emergencies, and fire; other standard practices (CARA's safety manual); and protocols for Wēkiu bug and cultural mitigation. Both CARA and the General Contractor will approve this manual.

The CARA Construction Manager will schedule mutually agreed upon meetings with the Archaeologist, Cultural Monitor, and OMKM, to ensure that work is being carried out according to applicable terms of the MOA.

G. EDUCATION

Prior to starting work on the project site, all project personnel and all contractor(s) employees will be briefed on and shown a videotape concerning the cultural significance of the project area. OMKM will be consulted on the production of the video and advised on the briefings. A natural resource specialist will brief them on the importance of protecting the Wēkiu habitat. Mitigating measures for both cultural and natural resources will be explained in detail. They will also be advised of procedures that must be taken in the event of an infraction of the conditions imposed on the project. Suggestions as to the most effective ways of informing their workers about the importance of adhering to all of the stipulations set forth in the agreement will also be discussed. The archaeological monitor and the cultural monitor will also give presentations to project personnel and contractor employees as specified in the MOA.

IV. CONTROLS

A. CONSTRUCTION SAFETY ZONES

1.0 Pu'u Hau Oki Crater Rim and Outer Slopes

Temporary 3-foot-high silt fences will be installed along the rim of the Puʻu Hauʻoki crater and outer slopes, where excavation or trenching is planned to take place where any significant potential that material may be overcast down slope. At a minimum the fences will be located down slope of any area to be excavated within 6 feet of the slope. The temporary silt fences will be maintained by the contractor on a daily basis to repair any damage.

2.0 Other Construction Areas

a) Construction safety fencing and temporary signage to deter unauthorized visitors and Observatory personnel from inadvertently entering into construction zones will delineate each area under construction. To the extent possible, the color of the fencing will blend in with the surrounding cinder terrain.

b) As the construction in each area is completed, the fencing and signage will be removed as soon as practicable.

c) The fencing and signage will remain at any area where archaeological artifacts are found until the State Historic Preservation Division approves removal, if any, of the fencing and temporary signage.

B. HEALTH AND SAFETY

1.0 Noise

a) The Contractor will minimize high noise levels from construction equipment by outfitting all equipment with proper noise muffling devices.

b) The Contractor will comply with State Department of Health (DOH) rules (HAR, Chapter 46, Community Noise Control).

2.0 Air Quality

The Contractor will comply with Hawaii DOH rules (HAR Chapter 11, Section 60.1, Air Pollution Control) and the County of Hawaii grading permit as well as this BMP.

a) Dust Control

- fugitive dust will be minimized by spraying with potable water or other environmentally acceptable suppressant as necessary. The Wekiu Bug Monitor will define what is environmentally safe; and
- all dust-generating activities will be suspended during high winds. The critical velocity of these winds will be determined later but is assumed to be about 40 to 50 miles per hour (64 to 80 kilometers per hour).
- Cinder stored in the summit stockpile area at the project site will be covered with heavy tarps as needed to minimize dust.

b) Emissions

- all engine emissions will be mitigated by the use of properly functioning emission control devices as required by law;
- all construction equipment will be properly maintained;
- equipment idling will be kept to a minimum when equipment is not in use.

3.0 Worker Safety

All personnel working on the project site including monitors must attend Pre-Start Safety Induction training that will cover at a minimum:

- CARA and Contractor Safety Policy
- Contractor MSDS Management and Control
- Discussion of harards associated with working at high alititude
- Review of lockout proceedure on dome and telescope.
- Reporting accidents
- Emergency medical treatment for workers in the event of an accident
- Dealing safely with hazardous materials
- Highlight the critical proceedures that are most likely to affect workers or the project.

The Contractor will comply with all OSHA standards and regulations.

C. WASTE CONTROLS

The Contractor will comply with all Hawaii DOH rules.

Every member of the construction crew, managers, observatory personnel, and other people associated with the proposed Outrigger Telescopes Project will undergo an orientation about the impacts of the Outrigger Telescope construction and installation, and how they may prevent and minimize disturbance caused by trash.

1.0 Solid Waste (Construction and Domestic)

a) Construction materials and supplies will be prevented from being blown into Wēkiu bug habitat and historic properties by covering them with heavy canvas tarps, using steel cables attached to anchors.

b) Construction trash containers will be tightly covered to prevent construction wastes from being dispersed by wind.

c) Outdoor trash receptacles will be secured to the ground and have secured lids and plastic liners.

d) "Roll off" containers will be equipped with heavy canvas tarps held securely with cables. Containers will be collected on a regular basis before they are completely full or overflowing.

e) All trash will be removed to an authorized disposal site in either Hilo or Waikoloa. This will be done on at least a weekly basis throughout the construction period.

f) As necessary, a magnetic device will be driven over roadways to remove metallic debris.

2.0 Toxic/Hazardous Waste

a) Contractors will minimize the on-site use of paints, thinners, and solvents.
b) Painting and construction equipment will not be cleaned on-site.
c) Contractors will keep a log of toxic/hazardous materials, if any, brought on-site and their disposition.
d) Spills will be immediately reported to the CARA Construction Manager who will activate the appropriate emergency response procedures.
e) Any toxic/hazardous waste generated by the construction project will be properly disposed of as recommended by CARA's Hazardous Disposal consultant.

D. ACCIDENTIAL CHEMICAL RELEASES

1.0 Precautions

a) Fuel tanks of equipment and construction vehicles will not be filled to the top.
b) Equipment will be properly secured during non-working hours, away from previously identified (during pre-construction activities) sensitive areas.
c) Fuel spill clean-up kits will be readily accessible at the work area at all times.

2.0 Spill Response Plan

a) Procedures for spill response are included in CARA's Safety Manual. Additional requirements will be added if necessary.
b) The Contractor will comply with all Federal and State DOH rules and regulations.

E. SPECIAL CONCERNS

1.0 Cultural Resources

a) Any human remains discovered during the construction process will immediately be reported to the CARA Construction Manager. As set forth in HAR 13-300-40, "Inadvertent discovery of human remains," the Archeologist will immediately order all work stopped in the area of the discovery and report the findings to the following:
   - the State Historic Preservation Division, unless the discovery occurs on Saturday, Sunday or holiday, at which time the report shall be made to the Division of Conservation and Resources Enforcement;
   - the University of Hawaii Office of Mauna Kea Management;
   - the Hawaii County medical examiner or coroner; and
   - the Hawaii County Police Department.

   Work in the discovery area can resume only upon approval of SHPD.
b) Because use of the construction staging and/or stockpile areas within the summit area of the Science Reserve may affect the landscape of a proposed historic property (the summit area of Mauna Kea), the following precautions must be observed:
   - construction materials stored at the site must be anchored in place and not be susceptible to movement by wind;
   - trash must not be scattered over the site; and

- trash containers must be secured to the ground and tightly covered to prevent construction wastes from being dispersed by wind.

c) The construction staging and stockpile areas on the summit (and in some instances at Hale Pohaku) must be inspected for compliance with the BMP every evening (after the work day is completed), and during high winds and storms. The construction staging and stockpile areas must also be inspected upon completion of all construction and habitat restoration activities to ensure that the areas have been restored.

d) All stipulations in the cultural resource MOA related to construction activities, as well as conditions attached to the Conservation District Use Permit, will be incorporated into this BMP and the construction contract.

2.0 Wēkiu Bug

a) Non-native species
- monitoring will be undertaken to identify any no-native species infestations at the Outrigger Telescopes construction site and staging areas;
- large deposits of soil, dirt and vegetation debris that may harbor non-native species will be removed from all earth-moving equipment by pressure washing or other means at the Contractor's base yard before ascending Mauna Kea;
- large trucks, tractors, and other heavy equipment will be inspected for non-native species at the Contractor's base yard or marine terminal and at the intersection of the Saddle Road and the Summit Road; the inspection near the intersection of the Saddle and Summit Roads will be conducted by a qualified biologist. If non-native species are found at the intersection of the Saddle and Summit Roads, the qualified biologist can either remove the non-native species or send the vehicle back to the base yard for required cleaning;
- the Contractor will ensure that all construction materials, crates, shipping containers, packaging material, and observatory equipment are free of non-native species when delivered to the summit; and
- new non-native species introductions detected during monitoring of the Outrigger Telescopes construction site and staging areas including, but not limited to, ants, yellow jackets and alien spiders, shall be eradicated.

b) Wēkiu Bug Habitat Protection
- soil-binding amendments will be used sparingly
- if construction materials and trash are blown into Wēkiu bug habitat (Figure 4), it will be collected by staff trained by the project entomologist taking care to minimize habitat disturbance.

c) Wēkiu Bug Habitat Restoration. Excess excavated material, not used for backfill or site grading, will be removed to the approved stockpile area, screened and washed. The cinder will be sieved for ½" and larger size and washed with an estimated 1 gal/ft^3. The sieving and washing process should be done simultaneously to minimize a dust plume. All material of suitable size will be used to restore Wēkiu bug habitat on or adjacent to Puʻu Hauʻoki. Any remaining material will be placed in the summit area after consultation with the SHPD and Office of Mauna Kea Management.

- The project entomologist will be on site during the habitat restoration and will have the necessary authority to ensure that the work is done properly;
- new cinder will be placed only on previously-disturbed surfaces;
- to the extent possible, the new cinder will match the existing cinder;
- washing of the cinder will be done in such a way that there is no erosion or other marking of the landscape by runoff;
- screening and washing of cinder will occur in an up-slope section of the staging area that is farthest removed from unaltered ground surfaces down slope.

3.0 Construction Staging Areas

a) The Hale Pohaku and summit construction staging areas will be inspected each evening to ensure that all materials are secured and that all trash is placed in appropriate approved containers.

b) When in use, the staging areas will be checked daily for oil spills from vehicles. These spills will be cleaned up immediately and the offending vehicle(s) will be removed from the mountain for maintenance.

c) The staging areas will be checked regularly for the presence of non-native species; any infestations will be immediately eradicated.

4.0 Potential Interference with Observatories

a) Use of exterior lighting is not permitted between sunset and sunrise.

b) Use of any radio transmitter that may interfere with observatory operations is not permitted.

5.0 Photographic Record

a) The contractor shall keep a photographic record of all construction activities on the site starting with pictures before any activities, during and after. This record shall be available for viewing in the site project office. At the end of the job the contractor will deliver 2 copies of the photos, one for CARA and another for OMKM.

V. ENFORCEMENT

It is the responsibility of the CARA Construction Manager to enforce the provisions of the BMP. All monitors will report their findings to him or her.

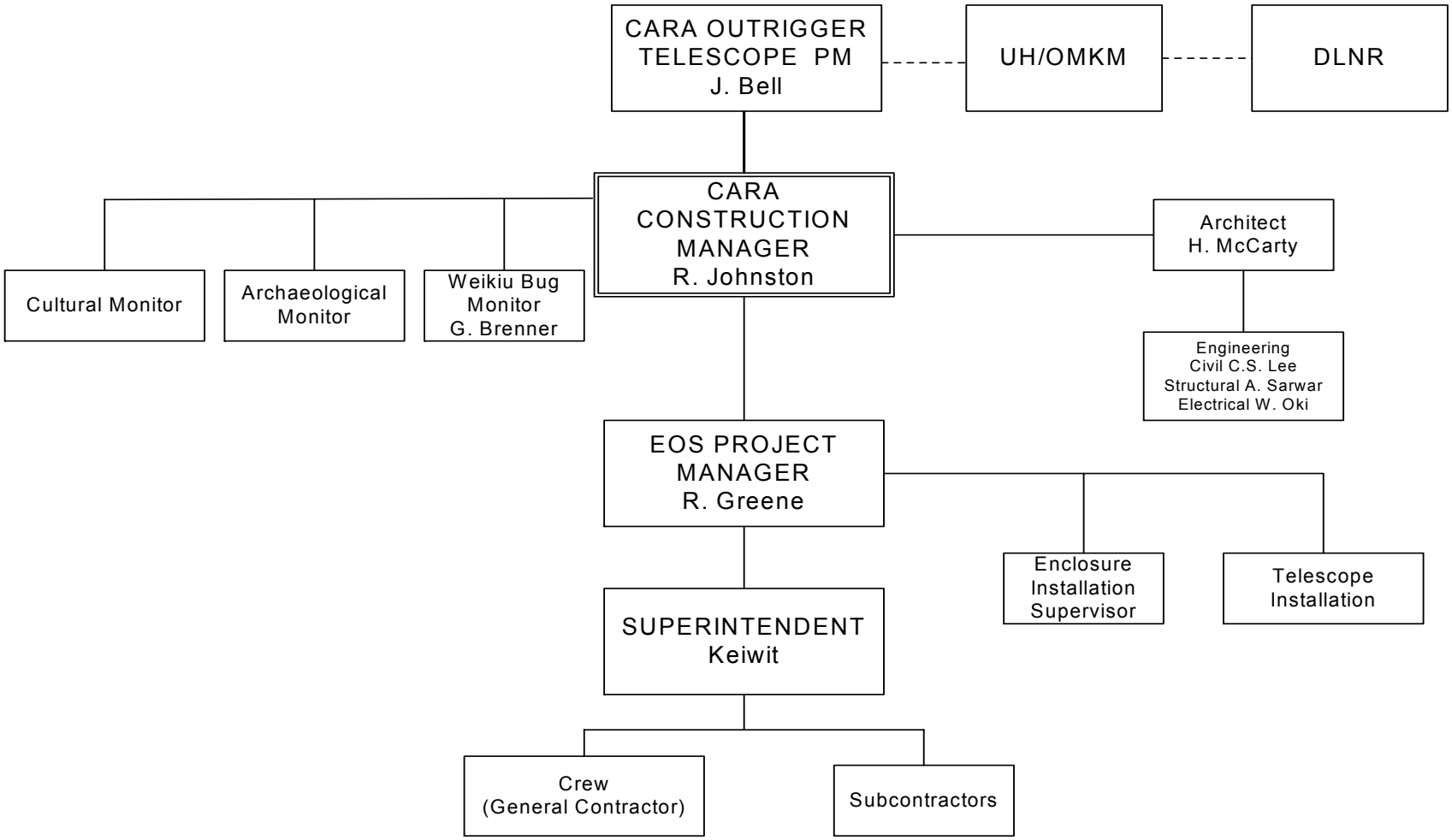


Figure 1
CONSTRUCTION MANAGEMENT ORGANIZATION CHART

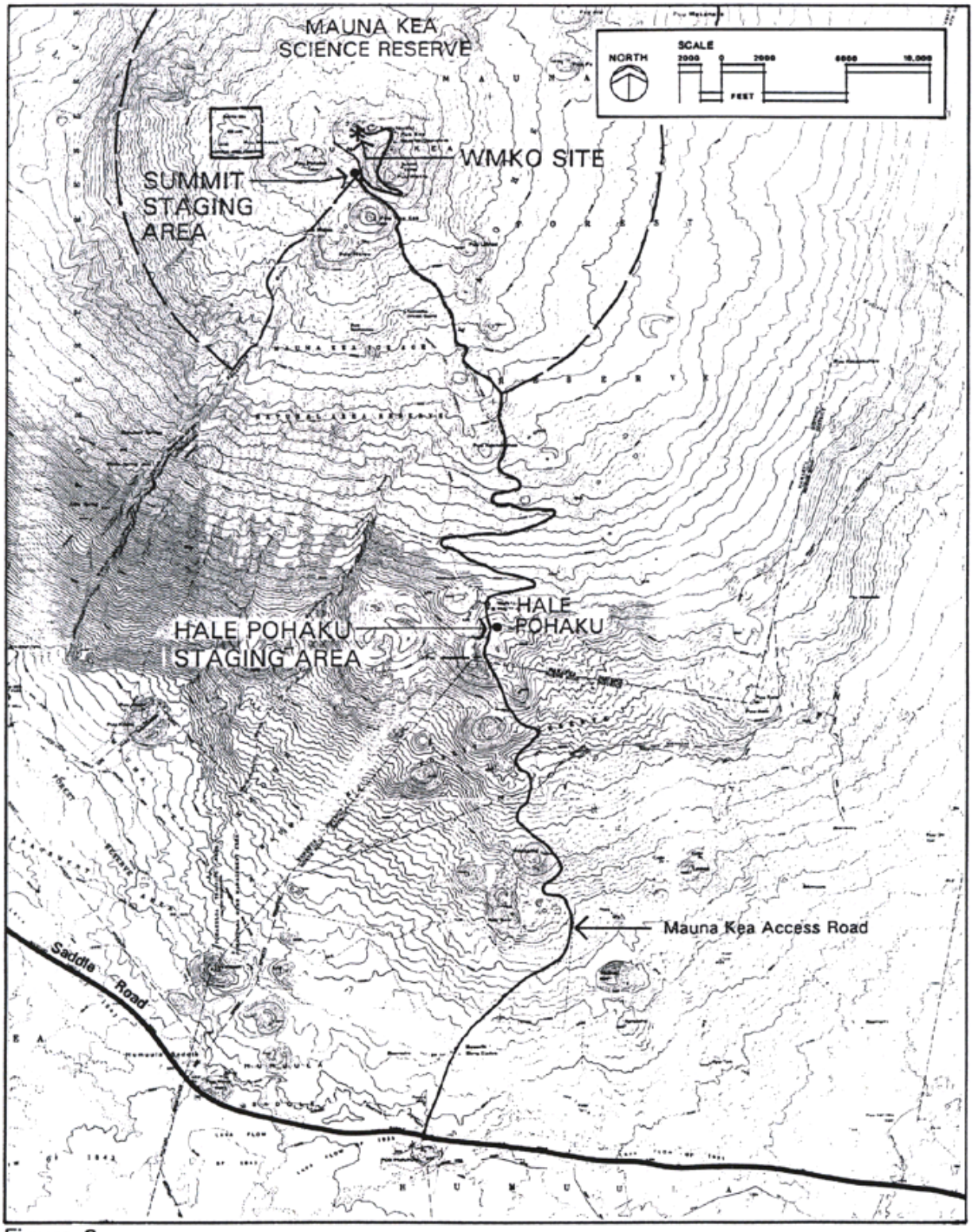


Figure 2
CONSTRUCTION STAGING AREAS

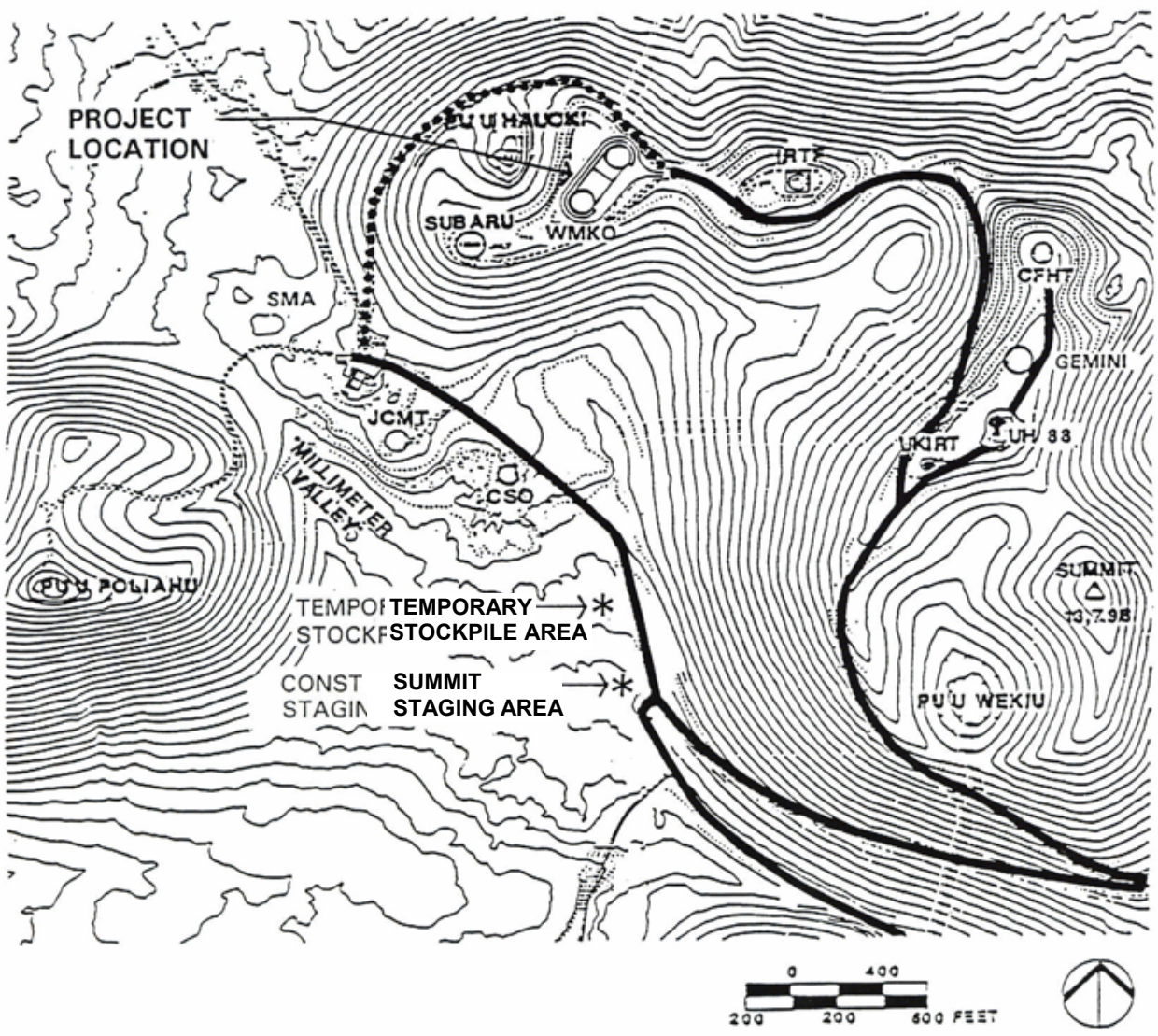
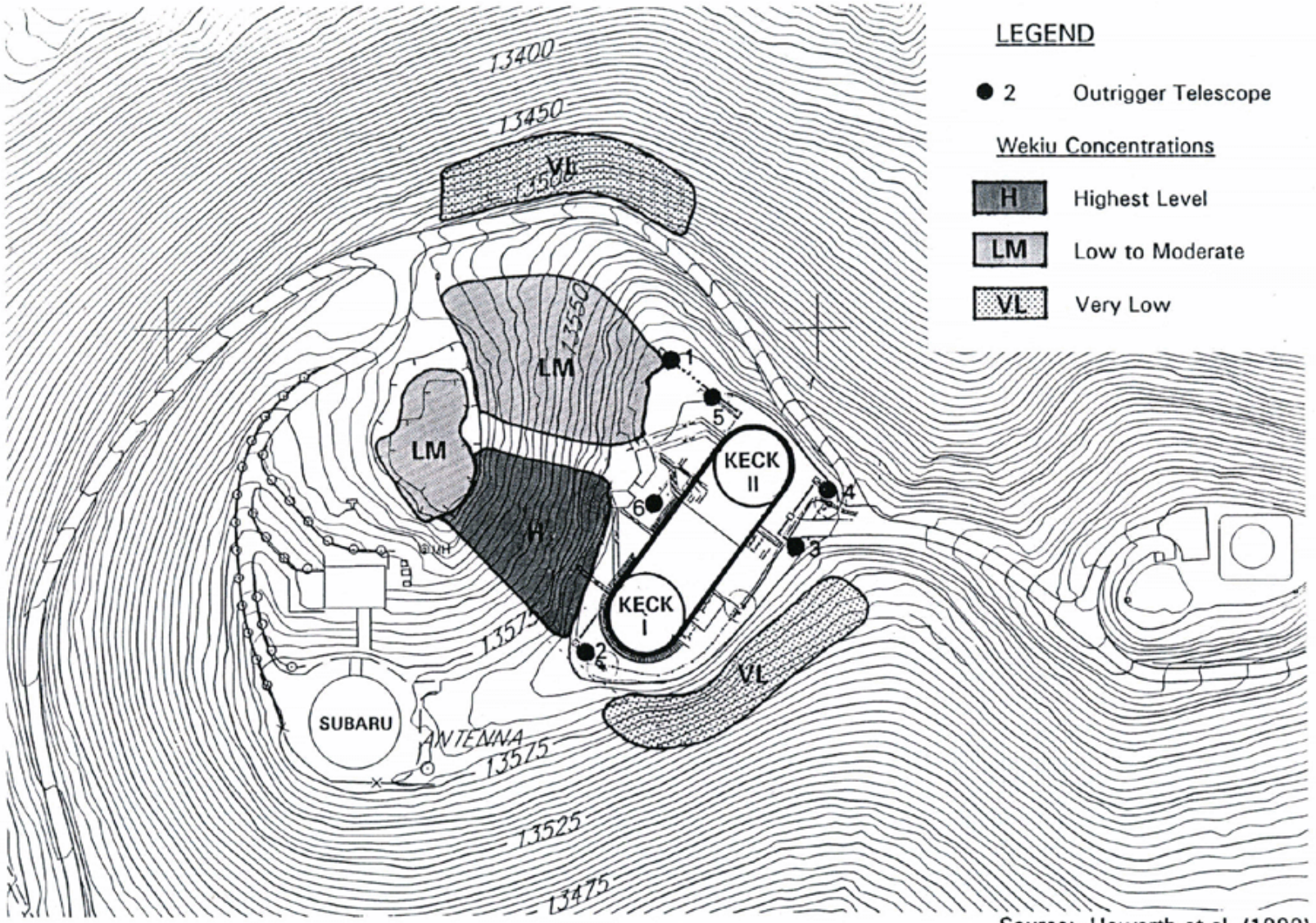


Figure 3
LOCATION OF THE PROJECT WITHIN THE SUMMIT AREA



Source: Howarth et al. (1999)

Figure 4

PU'U HAU OKI: AREAS OF WEKIU BUG CONCENTRATION (1997-1998)